

Revised: 8/6/80

8 /13/80

TO: Dave Chandler
FROM: Marie Butler-Knight
RE: Keyboard Component Service Manual (edited & restructured)
DATE: June 5, 1980

FRONT COVER

Mattel Electronics®

INTELLIVISION™ Intelligent Television

Keyboard Component

S E R V I C E

M A N U A L

(LEGAL COPY)

No. 1149-0380



KEYBOARD COMPONENT

SERVICE INSTRUCTIONS

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Tools and Equipment Needed

- o 1/8-inch nut driver
- o Phillips Head screwdriver
- o High Impedance (20,000 Ω /V) VOM Meter, \pm 1% accuracy
- o Video Test Cartridge (Mattel Part No. 1718)
- o Demonstration Cassette
- o Keyboard Component Test Cartridge (Mattel Part No. 3399)
- o Keyboard Test Cassette (Mattel Part No. 3398)

PARTS LISTMattel Part No.

COMPUTER II ASSEMBLY (LOGIC BOARD)	1149-9309
KEYBOARD ASSEMBLY	1149-9349
SWITCHING POWER SUPPLY ASSEMBLY (POWER BOARD)	1149-9219
TAPE CONTROL ASSEMBLY	1149-9239
TAPE DECK ASSEMBLY	1149-9129
TRANSFORMER ASSEMBLY	1149-9269
UPPER HOUSING	1149-6119
LOWER HOUSING	1149-2109
MICROPHONE WITH STAND	1149-2499
RF ADAPTER	1149-9059
FUSE, 3AG, NORMAL, 5A, 250V	0089-0803
ADHESIVE FOOT	2609-9489
PORT COVER	1149-2139
INSULATOR, TAPE CONTROL	1149-0230
KNOB, VOLUME CONTROL	1149-2039
PHILLIPS PAN HEAD SCREW 10-16 X 1/2 (TAPE DECK ASSEMBLY TO UPPER HOUSING)	0405-0304
PHILLIPS PAN HEAD SCREW 8-18 X 5/8 (KEYBOARD ASSEMBLY TO UPPER HOUSING) (TRANSFORMER RECEPTACLE TO LOWER HOUSING) (TAPE CONTROL ASSEMBLY & COMPUTER) (LOGIC ASSEMBLY TO LOWER HOUSING) (UPPER HOUSING TO LOWER HOUSING)	0405-0284
PHILLIPS PAN HEAD SCREW 10-16 X 3/8 (TRANSFORMER ASSEMBLY TO LOWER HOUSING)	0405-0314

Parts List (cont)

	<u>Mattel Part No.</u>
PHILLIPS PAN HEAD SCREW 8-18 X 5/16 (SWITCHING POWER SUPPLY ASSEMBLY TO LOWER HOUSING)	0405-0294
PHILLIPS PAN HEAD SCREW 8-18 X 1/2 (MASTER COMPONENT TO KEYBOARD COMPONENT)	0405-0354
CONICAL WASHER (KEYBOARD ASSEMBLY TO UPPER HOUSING)	0405-0474
CABLE TIE, 3 INCHES	0405-0784
COMPRESSION RINGS	0405-0574

FOR ADDITIONAL INFORMATION CALL THIS TOLL-FREE NUMBER:

EXCEPT CALIFORNIA. WITHIN CALIFORNIA, CALL

(213) 644-2752

(800)- 421-2826
COLLECT.

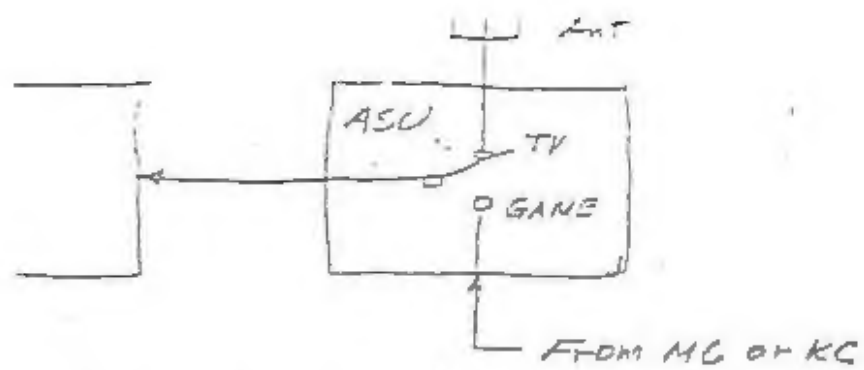


FIG 1 TV TEST SETUP

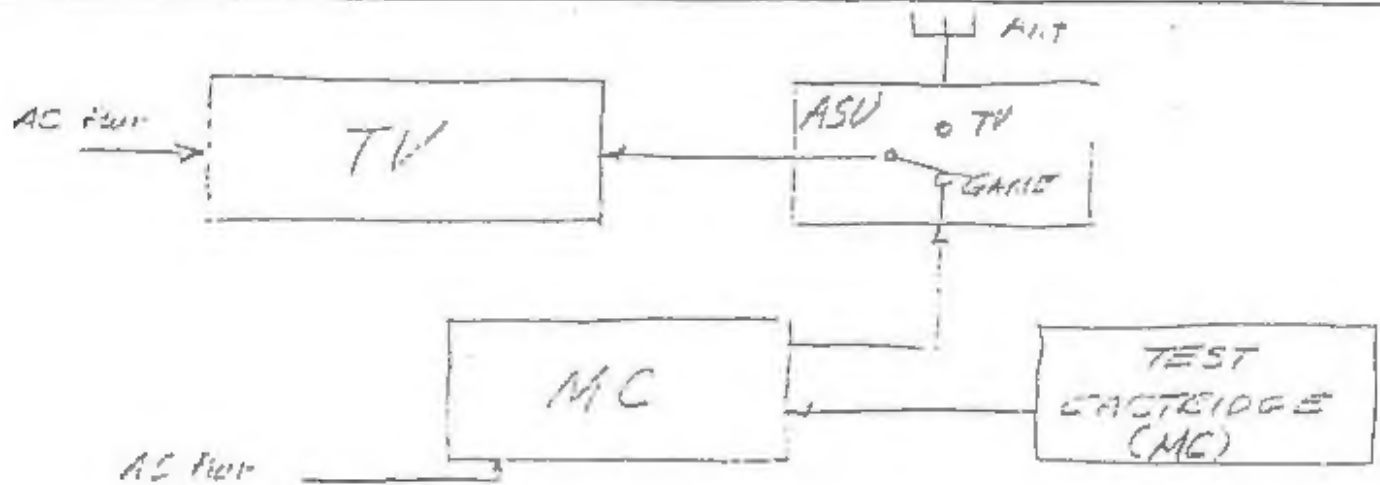


FIG 2 MASTER COMPONENT TEST SETUP

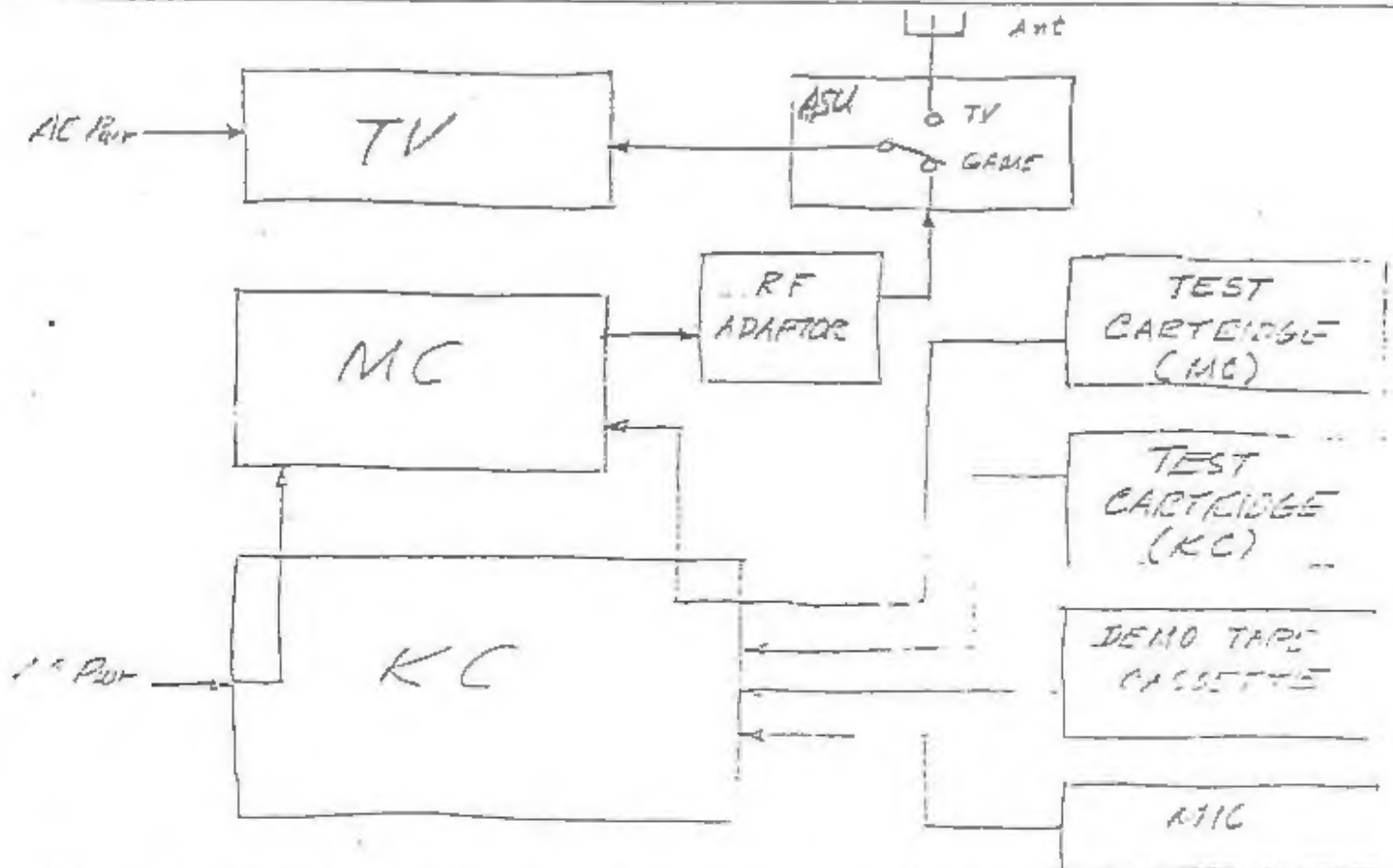


FIG 3 KEYBOARD COMPONENT TEST SETUP

DIAGNOSTIC ROUTINESECTION I--Is the TV Set working?

1. Connect TV to AC power source and connect TV antenna terminals to Antenna Switch Unit (ASU) as shown in figure below.

(PIX--Block diagram of TV Test Setup)

2. Set TV/GAME switch on ASU to TV and turn on the TV set. Make sure that video and audio of TV set are functioning properly.
3. If there is no broadcast signal, test ASU by bypassing it and connecting antenna directly to TV. Replace or repair ASU if required.
4. All other problems with TV set, repair TV.

SECTION II - Check out the MASTER COMPONENT

This test verifies operation of the Master Component when connected to Keyboard Component.

1. Connect TV, ASU, Master Component and Keyboard Component as shown in Figure A, page 0 and the diagram below.

(PIX--Block diagram of Keyboard Component Test Setup)

2. Insert Master Component TEST Cartridge into Cartridge Port of Keyboard Component.
3. Turn TV set on. Set TV/GAME switch to GAME position.
4. Set ON/OFF switch of Master Component to ON position and press RESET button.
5. Select cartridge by typing letter key "C". Press RETURN key.

6. Verify that Master Component is OK by conducting diagnostic program as described in Master Component Service Manual 2609-0380.

If Master Component tests OK with Diagnostic Cartridge, proceed to Keyboard Component check out, Section III.

If Master Component does NOT test OK, proceed with Steps A - F, below.

- A. Remove Master Component from Keyboard Component. Refer to Section IV, "Details of Disassembly", page __, and Figure B, page __.
- B. Connect TV, ASU and Master Component as shown in diagram below.

(FIG—Block diagram of Master Component Test Setup)

- C. Insert Master Component Diagnostic Cartridge into Master Component, as shown in Figure A, page 0.
- D. Turn TV set ON. Set TV/GAME switch to GAME position. Set ON/OFF switch of Master Component to ON position and press RESET button.
- E. Conduct diagnostic routine and repair (if required) in accordance with Master Component Service Manual 2609-2380.
- F. Repeat Master Component Verification Steps 1-6 to verify that Master Component performs OK with Keyboard Component.

NOTE : If a Master Component that is known to be OK does not work in Steps 1 - 6, proceed with Keyboard Component Diagnostic Routine to resolve problem.

SECTION III - KEYBOARD COMPONENT Check Out

IMPORTANT: THE TV SET AND MASTER COMPONENT MUST BE VERIFIED AS COMPLETELY OPERATIONAL (KNOWN TO BE OK) BEFORE THE FOLLOWING TESTS OF THE KEYBOARD COMPONENT MAY BE CONDUCTED. REFER TO SECTIONS I AND II.

(box) TURN ALL AUTOMATIC COLOR CIRCUITS TO MANUAL POSITION.

(subhead) SET UP

Connect TV set, ASU, Master Component and Keyboard Component as shown in Figure 3 below and Figure A Test Set Up, page 0.

(PIX—Block Diagram of Keyboard Component)

- Insert KEYBOARD COMPONENT TEST CARTRIDGE into RIGHT HAND receptacle at rear of Keyboard Component.
- Set TV/GAME switch of ASU to GAME position.

(subhead) KEYBOARD COMPONENT GO/NOGO TEST

The following diagnostic routine will indicate on the TV screen which components of the Keyboard Component require service or replacement. Refer to Section IV for detailed instructions for servicing each module within the Keyboard Component.

POWER TEST

POWER UP. (Set ON/OFF switch on Master Component to ON.) Press RESET button.

- o If TV screen displays as follows, proceed to Logic Board Test.

"INTELLIVISION"
Intelligent Television"

- o If TV screen remains blank, follow this procedure:

1. POWER DOWN. (Set ON/OFF switch on Master Component to OFF.)
2. Open Keyboard Component. Refer to Figures B and C, pages and .
(Observe that fuse F1 on switching power supply has not blown.
Replace as required.)
3. Set voltmeter for DC volts. Use low voltage scale.
4. POWER UP.

Table
4.1

4.1 Check that DC Voltages are as specified in table 4.1

DCV	UPPER	LOWER
+5	+5.15	+4.85
+12	+12.36	+11.64
-5	-5	-4.85

4.2 Adjust DC Voltages to be as specified in table 4.2

Table
4.2

DCV	UPPER	LOWER
+5	+5.05	4.45
+12	+12.12	+11.88
-5	No adjustment	No adjustment

KEYBOARD COMPONENT SERVICE MANUAL

A. IF +5, -5 AND +12 VDC VOLTAGES ARE WITHIN LIMITS, THE PROBLEM IS THE COMPUTER II ASSY. (LOGIC BOARD.) Replace board as follows: POWER DOWN. Replace logic board. (See Sec. IV, "Removal and Replacement of Logic Board," page ____ and Figures D and I, pages ____ and ____.) POWER UP. TV Screen should display: "INTELLIVISION™ Intelligent Television". Proceed to Logic Board Test on page ____.

B. IF ADJUSTING DC VOLTAGES TO LIMITS SPECIFIED IN STEP 4 ABOVE CAUSES THE TV SCREEN TO DISPLAY "INTELLIVISION™ Intelligent Television", proceed to logic board test.

C. IF THERE IS NO DC VOLTAGE PRESENT or if voltages cannot be adjusted within limits specified in Step 4, proceed as follows:

POWER DOWN. Disconnect cable between logic board and tape control assembly at J3 on tape control board. (Refer to Figure C, page ____.) Disconnect cable between power supply assembly and tape control assembly at J2. POWER UP. Check that +5V, +12 V DC, and -5 VDC are within limits specified in table 4.1. Adjust +5VDC and +12 VDC voltages if necessary.

1. IF DC VOLTAGES ARE OK WHEN TAPE CONTROL BOARD IS INSTALLED,
PROCEED TO STEP 5.

2. IF DC VOLTAGES ARE NOT OK WHEN TAPE CONTROL BOARD IS INSTALLED,
THE PROBLEM IS IN THE TAPE DECK ASSEMBLY OR THE TAPE
CONTROL ASSY. Proceed as follows:

POWER DOWN. Reconnect power cable between tape control board and
power supply board at J2. Disconnect two flat ribbon cables
between cassette drive assembly and tape control board. (See
Figure C, page __.) POWER UP. Check that DC voltages are within
limits specified above in Step C.

• IF DC VOLTAGES ARE OK OR CAN BE ADJUSTED TO BE OK, PROBLEM
IS IN TAPE DECK ASSEMBLY. POWER DOWN. Replace TAPE
DECK assembly. (Refer to Section IV, "Removal and Replacement
of TAPE DECK Assembly," page __ and Figure F, page __.)
Reconnect cable between logic board and tape control board.
Return to page __ and restart POWER TEST program.

• IF DC VOLTAGES ARE NOT OK, proceed as follows:
POWER DOWN. Replace tape control board. (refer to Section IV,
"Details of Disassembly," page __ and Figure D, page __.)
POWER UP. Assemble upper and lower cases of Keyboard Component
loosely. (Master Component may be replaced as shown in Figure H,
page __.) Return to page __ and restart POWER TEST program.

5. Set voltmeter to AC volts. POWER UP. Check for 17 to 23 VAC at test points on transformer cable connector at power supply board receptacle J1. (Refer to Figure I, page __.)

A. IF AC VOLTAGE IS WITHIN 17 TO 23 VAC, THE PROBLEM IS THE POWER SUPPLY BOARD. Proceed as follows:

POWER DOWN. Replace power supply board. (Refer to Section IV, "Removal and Replacement of Power Supply Board, p. __, and Figures D and I, pages __ and __.)

5.1 POWER UP.

Check that DC voltages are as specified in table 5.1

Table
5.1

DCV	UPPER	LOWER
+5	+5.15	+4.85
+12	+12.36	+11.64
-5	-5	-4.85

5.2 POWER UP.

Check that DC voltages can be adjusted as specified in table 5.2

Table
5.2

DCV	UPPER	LOWER
+5	+5.05	4.25
+12	+12.12	+11.88
-5	No adjustment	No adjustment

- o IF DC VOLTAGES ARE NOT OK OR CAN'T BE ADJUSTED TO THE ABOVE LIMITS, THE LOGIC BOARD IS FAULTY. Proceed as follows:
POWER DOWN. Replace logic board. (See Section IV, page __ and Figure D, page __.) POWER UP. Verify DC voltages are within limits specified above and proceed to Logic Board Test, page __.

c. IF DC VOLTAGES ARE OK, TV SCREEN SHOULD INDICATE:

"INTELLIVISION"
"Intelligent Television"

Proceed to Logic Board Test. If TV Screen is blank, but DC Voltages are OK, replace Logic Board and proceed to Logic Board Test.

B. IF AC VOLTAGE AT POWER SUPPLY RECEPTACLE IS NOT WITHIN 17 to 23 VAC, check that AC Voltage at transformer female receptacle is 105 to 125 VAC. If so, The problem is in THE POWER TRANSFORMER and THE POWER SUPPLY BOARD. Proceed as follows:

POWER DOWN. Replace power supply board. (See Section IV, page ____, and Figure 1, page ____.) Replace power transformer. (See Section IV, page ____, and Figure 1, page __.)

POWER UP. Check AC Voltage at power supply receptacle J1 is within 17 to 23 VAC.

(illus: TV screen displays--"INTELLIVISION™ Intelligent Television"

Check +5, -5 and +12 VDC voltages and adjust as required per

Step 4, page 0. With DC voltages OK, the TV screen should indicate;

"INTELLIVISION™" Proceed to Logic Board Test. If TV screen is blank but DC voltages are OK, replace logic board (See Section IV, page __.) and proceed to Logic Board Test.

LOGIC BOARD TEST

Logic testing is self programmed and does not require prompting from the operator. Upon completion of logic testing, a menu of the tests is displayed on the TV screen, which requires the operator to select either a KEYBOARD or TAPE test.

1. Self programmed logic testing is initiated by a POWER UP condition, but may also require that the RESET button on the Master Component is pushed.* ⁽¹⁾ Logic testing is indicated by the following legend:

(computer type)

EXECUTING SELF TEST - PLEASE STANDBY

followed shortly by:

C-1 - P
C-2 - "

CHECKING LOGIC BOARD

(illus: TV screen displays--"INTELLIVISION™ Intelligent Television"

2. Testing various logic circuits is indicated on the TV screen by the sequential addition of a legend to the above legend, identifying the logic. Additionally, an asterisk indicates the circuit under test.

- A. A SUCCESSFUL TEST is indicated by displaying the word PASS to the right of the logic description. The self test then moves on to the next circuit and adds it to the list. A typical display is as follows.

1)

* TYPE "I", then RETURN to verify that Diagnostic Cartridge is properly inserted. The last command displayed on the TV screen should be this:

"TEST DIAGNOSTICS"

If command is NOT displayed, verify that cartridge is properly inserted.

If the Test Diagnostics command still not appear, replace the logic board. When command does appear, initiate the automatic testing sequence by pressing "END", followed by RETURN.

IMPORTANT NOTE:

Leave computer alone while it performs the self-test. Do NOT press any key until directed to do so. You could well cause the wrong diagnostic message.

(Illus: TV set with message "REPLACE LOGIC BOARD--FAIL")

(computer
type)

CPU1-UP

CPU2 -UP

CHECKING LOGIC BOARD

* HR GRAPHICS RAM -PASS

CPU1-UP

CPU2 -UP

CHECKING LOGIC BOARD

HR GRAPHICS RAM -PASS

* KEYBOARD I/O PORT - PASS

- B. A FAILED LOGIC TEST is indicated as described above except the word FAIL is displayed and corrective action is displayed in a BLUE BOX at the bottom of the screen. A typical FAIL display is as follows:

(computer
type)

CPU1-UP

CPU2 -UP

CHECKING LOGIC BOARD

* HR GRAPHICS RAM FAIL

ACTION > REPLACE LOGIC BOARD

(Illus: TV set with message "REPLACE LOGIC BOARD--FAIL")

The indicated corrective steps should be carried out in the order given and the test program started again by the POWER UP sequence.

- C. WHEN SELF TESTING HAS BEEN COMPLETED, TV screen will display:

"SELF TEST COMPLETE--PLEASE STAND BY"

After a brief pause, TV screen will display a menu of tests as follows:

(computer
type)

TEST 1 --KEYBOARD

TEST 2 -- RAM

TEST 3 -- CH TEST (TO BE ENTERED BY USER)

TYPEWRITER KEYS--do they all work?

The Keyboard Test is initiated by pressing the number 1 key when the test menu is displayed on the TV screen.

The TV screen will display graphics representing the keyboard.

(PIX--Keyboard Graphics)

1. IF THE KEYBOARD IS OK, each character on the TV screen will block out when the corresponding key is depressed. The end product of an OK keyboard is a solid colored block for each character or key. When all characters have been blocked out, depress the CLEAR SCREEN key twice. This causes the test menu to be displayed again so that you can go on to the Tape Test.

(The space bar key is indicated at the top left of the display graphics. Such as a " ; " character.)

(PIX--Keyboard Graphics for OK keyboard)

NOTE: This test is best accomplished by running a fingernail along each row of keys on the keyboard, depressing each and every key in turn.

2. IF THE KEYBOARD IS NOT OK, characters on the TV screen will not block out when depressed. Characters remaining on the screen may be tested by depressing the appropriate key. The corrective action for a keyboard that is NOT OK is as follows:
 - A. POWER DOWN
 - B. Replace keyboard. (Refer to Section IV, "Removal and Replacement of Keyboard," page __, and Figure E, page __.)
 - C. POWER UP AND RESTART KEYBOARD TESTS AGAIN
 - D. Select Keyboard test again. If Keyboard test again indicates a bad keyboard, replace the logic board (see Section IV, page __) and resume testing at Section III, page __.

TAPE TEST

The Tape Test is initiated by pressing the number 2 key

, when the test menu is displayed on the TV screen.

1. Upon initiating the Tape Test, the TV screen will display the following legend:

(computer
type)

PROCEED WITH DRIVE MAINTENANCE

DEPRESS <CLRSCRN> <CLRSCRN> WHEN DONE

2. The cassette drive will eject the tape and proceed into Play mode. If the Eject mode fails, carry out the following corrective steps in the order given. (Refer to Section IV, pages ___ and ___, and Figures D and E, page ___ and ___.)

REPLACE TAPE DECK ASSEMBLY

REPLACE TAPE CONTROLLER

REPLACE LOGIC BOARD

After each step, run through the entire test procedure again starting with the POWER UP sequence. If necessary, depress the RESET button on the Master Component after POWER UP.

3. Drive maintenance should be conducted as follows:

- A. Cassette drive will enter the Playback mode with cassette holder raised. Clean the heads, capstan and pinch roller with alcohol and a clean cotton swab, as described in the owner's manual.

NOTE: Be sure to apply the swab to the right (from front) side of the capstan and pinch roller, NOT the left.

- B. Visually verify heads are moved forward to Playback position.
- C. Visually verify tape reel drive shaft is rotating.

4. Minimum Tape Test is initiated by pressing CLEAR SCREEN key twice upon completion of drive maintenance operations. The minimum tape test is self-programmed and requires the use of the Demonstration Cassette.
 - A. Insert the Demonstration Cassette and manually close cassette housing door.
 - B. The minimum test program will test all tape functions, including pre-recorded and home-recorded digital tracks.
5. The Home Audio Test will be presented automatically upon satisfactory completion of the Minimum Tape Test. The Home Audio Test requires that you plug the microphone into the microphone jack on the Keyboard Component.
 - A. A menu of tests will be presented on the TV screen, indicating which LETTER keys on the keyboard you should depress to activate the cassette drive in all tape operation modes. Example: the letter E will appear under Eject.

(PIX—graphic display for Home Audio Test)

- B. The user can manually check each tape operation mode of the cassette drive in order to locate faults or verify correct operation of the home-recorded audio tracks only. If the cassette drive fails in any mode, carry out the following corrective steps in the order given:

REPLACE TAPE DRIVE ASSEMBLY

REPLACE TAPE CONTROLLER

REPLACE LOGIC BOARD

AFTER REPAIRS TO THE UNIT HAVE BEEN COMPLETED, THE UNIT SHOULD BE BUTTONED UP AND THE CASSETTE INSERTED. TYPE "T", THEN RETURN TO START FINAL TEST OF ALL FUNCTIONS BEFORE DELIVERING THE KEYBOARD COMPONENT TO THE CUSTOMER.

1. REMOVAL OF MASTER COMPONENT FROM KEYBOARD COMPONENT.
 - A. Remove power cord plug of Keyboard Component from wall outlet.
 - B. Unplug RF adaptor from Master Component via Keyboard Component opening
 - C. Make certain that both hand-held controllers are in place on the Master Component.
 - D. Turn the entire assembly upside-down. Hold Master Component in place with one hand while unscrewing the five 8-18 1/2" interconnecting screws shown in figure B, page . (Use a Phillips head screwdriver) After all five screws have been removed turn the entire assembly right side up.
 - E. Ease the Master Component out of the Keyboard Component recessed area, drawing excess ribbon cable and power cord from their respective storage pockets
 - F. Unplug Master Component power cord from Keyboard Component mating receptacle. (See Figure)
 - G. Remove Keyboard Component signal connector plug from the Master Component cartridge port. (See Figure)
 - H. Set the Master Component aside.
2. SEPARATION OF KEYBOARD COMPONENT, UPPER AND LOWER HOUSINGS
 - A. Remove Master Component from Keyboard Component as described in paragraph 1.
 - B. Turn Keyboard Component upside-down.
 - C. Remove the nine 8-18 X 5/8" screws which connect the upper and lower housing assemblies together (See figure B). (Use a Phillips head screwdriver).
 - D. Place Keyboard Component on side and carefully separate the upper and lower housings.
 - E. Place the units as shown in figure C with the upper housing upside down positioned next to the lower housing so that the fronts of the two housings are touching.

REMOVAL AND REPLACEMENT OF COMPUTER II ASSEMBLY

3. REMOVAL AND REPLACEMENT OF COMPUTER II ASSEMBLY (SEE FIGURE D)
 - A. Unplug Computer II power cable from switching power supply assembly.
 - B. Unplug Computer II tape control signal cable from tape control assembly.
 - C. Remove the nine 8-16 X 5/8" screws which hold Computer II assembly in place.
 - D. Unplug Keyboard cable connector from Computer II. (See Figure E.)
 - E. Lift Computer II assembly out of lower housing.
 - F. Install replacement Computer II assembly by reversing steps A through D.
4. REMOVAL AND REPLACEMENT OF TAPE DECK ASSEMBLY (SEE FIGURE F)
 - A. Unplug the two 9 conductor flat ribbon cables from the tape control assembly.
 - B. Unplug the 9 conductor and the two conductor cables from the preamp subassembly of the tape deck assembly.
 - C. Remove the 10-16 X 1/2" screws which hold the tape deck assembly in place.
 - D. Manually depress cassette eject solenoid until the tape cover opens.
 - E. Remove tape deck assembly from the upper housing.
 - F. Install replacement tape deck assembly by reversing steps E through A.
5. REMOVAL AND REPLACEMENT OF SWITCHING POWER SUPPLY ASSEMBLY
 - A. Unplug Computer II power cable from switching power supply (see figure D).
 - B. Unplug tape control assembly power cable from switching power supply.

- C. Unplug transformer assembly connector from switching power supply.
- D. Unplug Computer II tape control cable from tape control assembly and fold back across top of Computer II assembly.
- E. Remove the three 8-18 X 5/16" screws which hold the switching power supply in place.
- F. Remove switching power supply from the lower housing.
- G. Install replacement switching power supply by reversing steps F through A.

6. REMOVAL AND REPLACEMENT OF TRANSFORMER ASSEMBLY

- A. Unplug transformer assembly connector from switching power supply.
- B. Remove the two 8-18 X 5/8" screws holding the transformer assembly female receptacle in place.
- C. Remove the four 10-16 X 3/8" screws securing the transformer assembly to the lower housing.
- D. Remove transformer assembly from lower housing.
- E. Install replacement transformer assembly by reversing steps D through A.

7. REMOVAL AND REPLACEMENT OF KEYBOARD ASSEMBLY

- A. Unplug Keyboard cable from Computer II assembly.
- B. Remove the six 8-18 X 5/8" screws which secure the Keyboard to the upper housing. Be careful not to lose the six conical ramp washers.
- C. Remove the Keyboard assembly from the upper housing.
- D. Install replacement Keyboard by reversing steps C through A.

8. REMOVAL AND REPLACEMENT OF TAPE CONTROL ASSEMBLY

- A. At the tape control assembly, unplug the two, 9-conductor flat ribbon cables connecting the tape deck assembly.
- B. At the tape deck assembly, unplug the 9-wire and the

KEYBOARD COMPONENT SERVICE MANUAL

2-wire cables connecting the tape control assembly.

- C. At the tape control assembly, unplug the 20-conductor flat ribbon cable connecting the Computer II assembly.
- D. At the switching power supply assembly, unplug the 6-conductor flat ribbon cable connecting the tape control assembly.
- E. Remove the three 8-18 5/8" screws which secure the tape control assembly to the lower housing.
- F. Remove the tape control assembly by tilting the inboard edge of the assembly upward so that it clears the transformer assembly, while moving the assembly inboard to allow the volume control knobs to be withdrawn from the side of the lower housing.
- G. Replace the tape control assembly by reversing steps F through A.

SECTION FIVE--

Add -illustration page:

(Exploded view of keyboard component with
identifying feature captions)

Figure D
Removal of Power Supply Board
and Logic Board

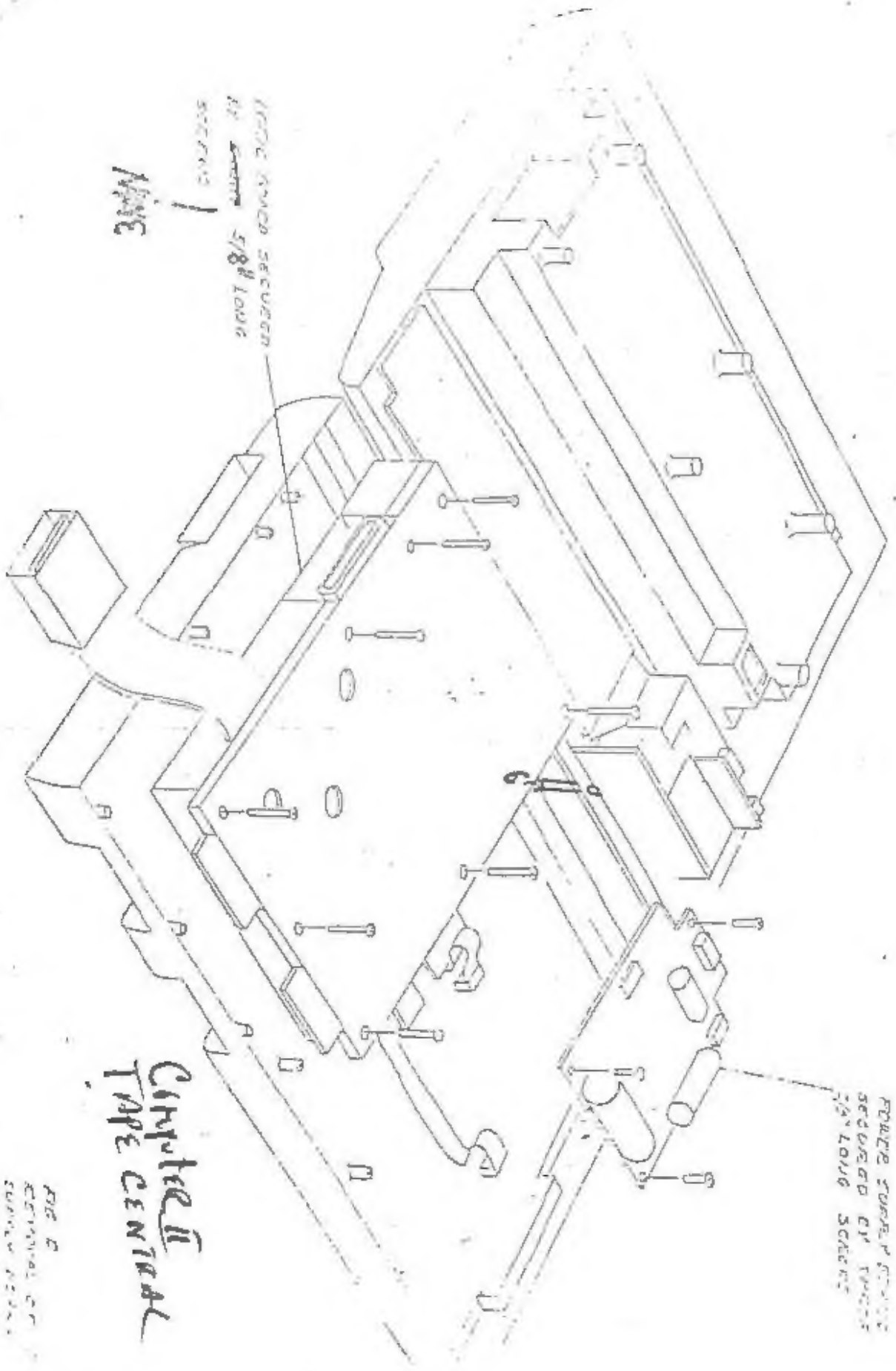


Figure E
Removal of Keyboard

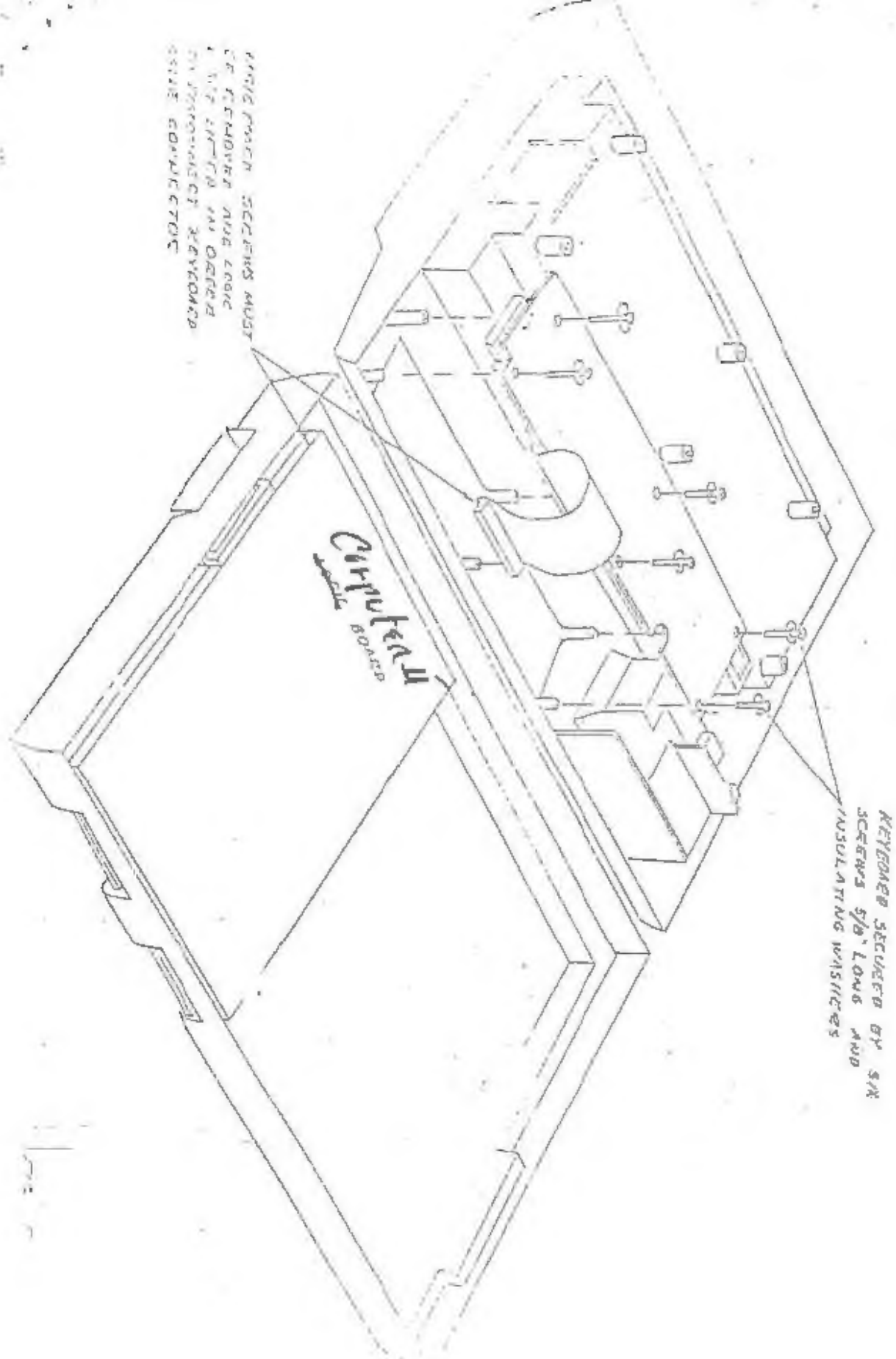


Figure G

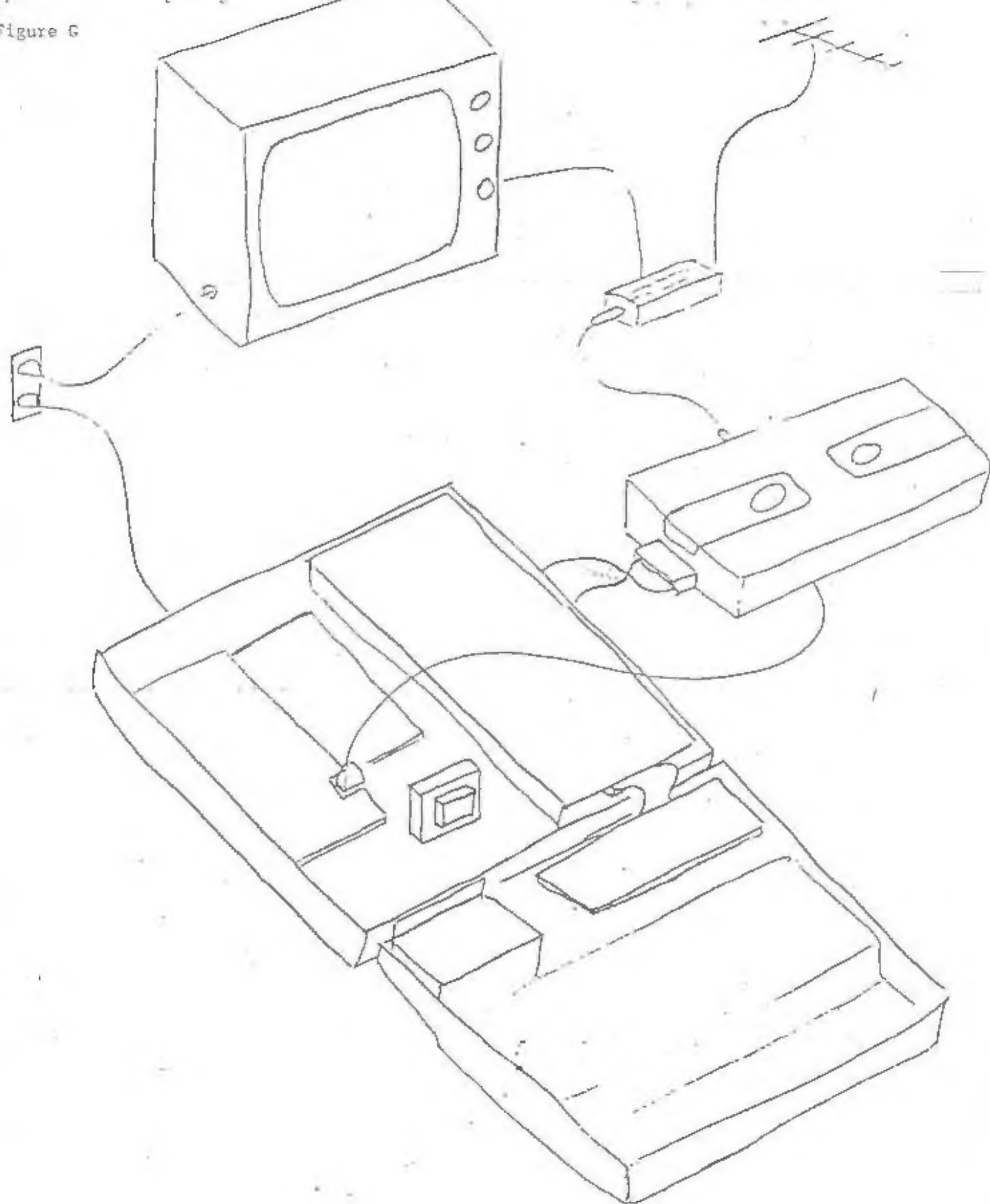


Figure G